

40ml.

22. (New) The optical scanning device of claim 18, wherein said surface shape comprises an aspheric shape.

23. (New) The optical system of claim 6, wherein the step surface is oriented substantially parallel to said aspheric shape.

Remarks

Currently pending claims 2-23 are for consideration by the Examiner. Claim 1 is cancelled herein. Claims 18-23 are new. Claims 2-17 are amended herein.

The Examiner objected to claims 2-5 and 8-16 as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicant gratefully acknowledges the Examiner's indication of allowable subject matter.

The Examiner rejected claims 1 and 17 under 35 U.S.C. 102(b) as being anticipated by Bressers et al (USPN 4829506).

The Examiner rejected claims 1, 6 and 17 under 35 U.S.C. 102(b) as being anticipated by Shiono et al (EP 0468410A1).

The Examiner rejected claims 1, 6, 7 and 17 under 35 U.S.C. 102(b) as being anticipated by Londono et al (USPN 5260828).

Applicants respectfully traverses the §102 rejections with the following arguments.

35 U.S.C. 102(b)

Bressers

The Examiner rejected claims 1 and 17 under 35 U.S.C. 102(b) as being anticipated by Bressers et al (USPN 4829506). The Examiner alleges that “Bressers et al teach all of the claimed elements including an optical scanning device having a non-periodic phase structure (column 6, lines 61-64) and having the non-periodic phase structure arranged to compensate for comatic aberrations (column 3, lines 1112).”

Applicants maintain that said rejection of claim 1 is moot since claim 1 has been cancelled.

Applicant respectfully contends that Bressars does not anticipate claim 17, because Bressars does not teach each and every feature of claim 17. For example, Bressars does not teach “the first step having a surface located opposite to a surface shape followed by the optical element such that all points on the surface of the first step are located at about a constant distance from said surface shape”. The grating 9 in Bressars does not include a step in accordance with claim 17. Based on the preceding argument, Applicants respectfully maintain that Bressars does not anticipate claim 17, and that claim 17 is in condition for allowance.

Shiono

The Examiner rejected claims 1, 6 and 17 under 35 U.S.C. 102(b) as being anticipated by Shiono et al (EP 0468410A1). The Examiner alleges that “Shiono et al teach of a diffractive optical lens having angular zones having substantially the same height (column 5, lines 28-30) with respect to a rotationally symmetrical aspheric shape and providing a plurality of elliptical grooves (Figure 3) for the correction of coma (abstract). Shiono et al also teach that the phase

structure formed onto the optical element (column 2, lines 10-23).”

Applicants maintain that said rejection of claim 1 is moot since claim 1 has been cancelled.

Applicant respectfully contends that Shiono does not anticipate claim 6, because Shiono does not teach each and every feature of claim 6. For example, Shiono does not teach “a rotationally symmetrical **aspheric shape** generally followed by said objective lens” (emphasis added). As another example, Shiono does not teach “said step having a surface located at the substantially constant height such that all points on said step surface are located at about a **constant distance** from said aspheric shape” (emphasis added). FIG. 3b of Shiono shows that each elliptical groove in grating zone 7a and in core section 7b has an elliptically shaped surface, and the points on each such elliptically shaped surface are at a non-constant distance from a shape followed by the lens portion 7. Based on the preceding arguments, Applicants respectfully maintain that Shiono does not anticipate claim 6, and that claim 6 is in condition for allowance.

Applicant respectfully contends that does not anticipate claim 17, because Shiono does not teach each and every feature of claim 17. For example, Shiono does not teach “the first step having a surface located opposite to a surface shape followed by the optical element such that all points on the surface of the first step are located at about a constant distance from said surface shape”. FIG. 3b of Shiono shows that each elliptical groove in grating zone 7a and in core section 7b has an elliptically shaped surface, and the points on each such elliptically shaped surface are at a non-constant distance from a shape followed by the lens portion 7. Based on the preceding argument, Applicants respectfully maintain that Shiono does not anticipate claim 17, and that claim 17 is in condition for allowance.

Londono

The Examiner rejected claims 1, 6, 7 and 17 under 35 U.S.C. 102(b) as being anticipated by Londono et al (USPN 5260828). The Examiner alleges that “Londono et al teach of a diffractive lens element composed of a single material (column 1, lines 7-8) for the correction of coma (column 1, lines 67-68 through column 2, lines 1-2). Londono et al also teach all phase steps as being 27r (column 7, lines 13-15).”

Applicants maintain that said rejection of claim 1 is moot since claim 1 has been cancelled.

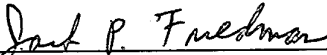
Applicant respectfully contends that Londono does not anticipate claim 6, because Londono does not teach each and every feature of claim 6. For example, Londono does not “said step having a surface located at the substantially constant height such that all points on said step surface are located at about a **constant distance** from said aspheric shape” (emphasis added). FIG. 1 of Londono shows that the annular grooves 22 have outer profiles 24, and that the points on each such outer profile 24 are at a non-constant distance from the lens surface 16. Based on the preceding arguments, Applicants respectfully maintain that Londono does not anticipate claim 6, and that claim 6 is in condition for allowance. Since claim 7 depends from claim 6, Applicants respectfully maintain that claim 7 is likewise in condition for allowance.

Applicant respectfully contends that does not anticipate claim 17, because Londono does not teach each and every feature of claim 17. For example, Londono does not teach “the first step having a surface located opposite to a surface shape followed by the optical element such that all points on the surface of the first step are located at about a constant distance from said surface shape”. FIG. 1 of Londono shows that the annular grooves 22 have outer profiles 24, and that the points on each such outer profile 24 are at a non-constant distance from the lens surface 16. Based on the preceding argument, Applicants respectfully maintain that Londono does not anticipate claim 17, and that claim 17 is in condition for allowance.

Conclusion

Applicant respectfully believes that all pending claims, and the entire application, are in condition for allowance and therefore request favorable action. However, should the Examiner believe anything further is necessary in order to place the application in better condition for allowance, or if the Examiner believes that a telephone interview would be advantageous to resolve the issues presented, the Examiner is invited to contact the Applicants' undersigned representative at the telephone number listed below.

Respectfully submitted,


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Appendix A. Identification of Amended Material

Please amend claims 2-17 as follows:

2. (Amended) An optical scanning device [according to claim 1] for scanning optical record carriers with radiation of a selected wavelength, the device including an objective lens, having an axial direction and a radial direction, the objective lens having a phase structure which is non-periodic with respect to the radial direction, the non-periodic phase structure being arranged to compensate for comatic aberrations generated in the objective lens when an optical record carrier is read in a direction which is non-axial with respect to said objective lens, wherein said non-periodic phase structure compensates at least 50% of the root mean square (rms) comatic wavefront error at a certain field angle with respect to the axial direction and caused by the objective.

3. (Amended) [An] The optical scanning device [according to] of claim 2, wherein said non-periodic phase structure compensates at least 70% of the root mean square (rms) comatic wavefront error at [a] said certain field angle [with respect to the axial direction and caused by the objective].

4. (Amended) An optical scanning device [according to claim 1] for scanning optical record carriers with radiation of a selected wavelength, the device including an objective lens, having an axial direction and a radial direction, the objective lens having a phase structure which is non-periodic with respect to the radial direction, the non-periodic phase structure being arranged to compensate for comatic aberrations generated in the objective lens when an optical record carrier

is read in a direction which is non-axial with respect to said objective lens, wherein the rms wavefront error caused by the comatic aberration generated by the objective lens at a maximum required field angle with respect to the axial direction, as compensated by the non-periodic phase structure, is less than $40\text{m}\lambda$.

5. (Amended) [An] The optical scanning device [according to] of claim 4, wherein the rms wavefront error [caused by the comatic aberration generated by the objective lens at a maximum required field angle with respect to the axial direction, as compensated by the non-periodic phase structure,] is less than $20\text{m}\lambda$.

6. (Amended) An optical scanning device [according to claim 1] for scanning optical record carriers with radiation of a selected wavelength, the device including an objective lens, having an axial direction and a radial direction, the objective lens having a phase structure which is non-periodic with respect to the radial direction, the non-periodic phase structure being arranged to compensate for comatic aberrations generated in the objective lens when an optical record carrier is read in a direction which is non-axial with respect to said objective lens, wherein said non-periodic phase structure includes a plurality of annular zones, each of said zones comprising a step of a substantially constant height with respect to a rotationally symmetrical aspheric shape generally followed by said objective lens, said step having a surface located at the substantially constant height such that all points on said step surface are located at about a constant distance from said aspheric shape.

7. (Amended) [An] The optical scanning device [according to] of claim 6, wherein said steps [in said non-periodic phase structure] generate a relative phase difference of approximately a

multiple of 2π for radiation of said selected wavelength when an optical record carrier is read in said axial direction.

8. (Amended) [An] The optical scanning device [according to] of claim 6, wherein the radial widths of said zones are selected in dependence on the comatic aberration to be compensated for.

9. (Amended) [An] The optical scanning device [according to] of claim 8, wherein said zones comprise a zone (a) with a nonzero height, measured in relation to said aspheric shape, located in the region in which the normalized pupil coordinate ρ ranges from 0.45 to 0.84.

10. (Amended) [An] The optical scanning device [according to] of claim 9, wherein said zone (a) ends prior to a normalized pupil coordinate ρ of 0.85.

11. (Amended) [An] The optical scanning device [according to] of claim 8, wherein said zones comprise a zone (b) with a nonzero height, measured in relation to said aspheric shape, located in the region in which the normalized pupil coordinate r ranges from 0.9 to 1.00.

12. (Amended) [An] The optical scanning device [according to] of claim 11, wherein said zones comprise a plurality of zones with a nonzero height, measured in relation to said aspheric shape, located in the region in which the normalized pupil coordinate ρ ranges from 0.9 to 1.00.

13. (Amended) [An] The optical scanning device [according to] of claim 6, wherein the heights of said zones are selected substantially optimally in relation to the comatic aberration to be compensated for.

14. (Amended) [An] The optical scanning device [according to] of claim 7, wherein the number of said zones is greater than four.

15. (Amended) [An] The optical scanning device [according to] of claim 8, wherein the number of said zones is less than ten.

16. (Amended) [An] The optical scanning device [according to] of claim 9, wherein said non-periodic phase structure is formed on the surface of said objective lens.

17. (Amended) An optical system including an optical element having optical power and an axial direction and a radial direction, [and] the optical element having a phase structure which is non-periodic with respect to the radial direction, the non-periodic phase structure being arranged to compensate for comatic aberrations generated by the optical element when an optical beam traverses the optical system in a direction which is non-axial with respect to said element, [whereby an improved field of view is provided for said optical element] the non-periodic phase structure having a first step, the first step having a surface located opposite to a surface shape followed by the optical element such that all points on the surface of the first step are located at about a constant distance from said surface shape.